SCOPE & DEFINITIONS

This chapter contains standards for air emissions sources. Criteria addressing open burning of solid waste are contained in Chapter 7.

Cold Cleaning Machine – Any device or piece of equipment that contains and/or uses liquid solvent, into which parts are placed to remove soils and other contaminants from the surfaces of the parts or to dry the parts. Cleaning machines that contain and use heated, nonboiling solvent to clean the parts are classified as cold cleaning machines.

Combustion Unit – Any unit in which combustible products are oxidized so that the heat generated in this operation is used. Units include steam, heat, and energy/power production units.

Engler Degree – Unit of viscosity, symbolized as °E.

Fossil Fuel – Natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such material for the purpose of creating useful heat.

Freeboard Ratio – The ratio of the solvent cleaning machine freeboard height to the smaller interior dimension (length, width, or diameter) of the solvent cleaning machine.

Incinerator – Any furnace used in the process of burning solid or liquid waste for the purpose of reducing the volume of the waste by removing combustible matter, including equipment with heat recovery systems for either hot water or steam generation.

Motor Vehicle – Any commercially-available vehicle that is not adapted to military use which is self-propelled and designed for transporting persons or property on a street or highway, including (but not limited to) passenger cars, light duty vehicles, and heavy duty vehicles.

Ozone-Depleting Substances (ODS) – Those substances listed in Table 2.5.

Pathological Waste – Waste material consisting of only human or animal remains, anatomical parts, and/or tissue, the bags/containers used to collect and transport the waste material, and animal bedding (if applicable).

Process Heater – A device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst.

Pyrolysis – The endothermic gasification of hospital waste and/or medical/infectious waste using external energy.

Steam Generating Unit – A device that combusts any fuel and produces steam or heats water or any other heat transfer medium. This definition does not include nuclear steam generators or process heaters.

Vapor Cleaning Machine – A batch or in-line solvent cleaning machine that boils liquid solvent generating solvent vapor that is used as a part of the cleaning or drying cycle.

CRITERIA

C2.1 COMBUSTION UNITS

Installations that operate combustion units will provide the Spanish Base Commander with sufficient information to seek an operating permit for their units (see Chapter 1 for the process). A technical report (with the facility's design specifications) and an annex with the corresponding environmental information (including data on the projected air emissions) must be submitted with the permit request. The Spanish Base Commander may submit the permit request and technical report to the Technological Development and Employment Department of Andalusia (Consejería de Empleo y Desarrollo Tecnológico).

C2.1.1 Air Emissions Standards. The following criteria apply to combustion units as indicated below.

C2.1.1.1 Combustion units and associated emissions controls must be designed to meet the emission standards for specific sized units shown in Table 2.1, Table 2.2, and Table 2.3 (as applicable) at all times, except during periods of start up, shut down, or when emergency conditions exist.

C2.1.1.2 For combustion units with a maximum design heat input capacity of 2.93 MW (10 MBtu/hr) or greater combusting liquid or solid fossil fuels, the fuel sulfur content (weight percent) and higher heating value will be measured and recorded for each new shipment of fuel. This data will be used to calculate sulfur dioxide (SO_2) emissions and document compliance with the SO_2 limits in Table 2.1 and Table 2.2. Alternatively, installations will install a properly calibrated and maintained continuous emissions monitoring system (CEMS) to measure the flue gas for SO_2 and either oxygen (O_2) or carbon dioxide (CO_2).

C2.1.2 Air Emissions Monitoring Requirements. Combustion units with a maximum design heat input capacity of 2.93 MW (10 MBtu/hr) or greater that are subject to the opacity or NO_X standards in Table 2.1 or Table 2.2 must have a properly calibrated and maintained CEMS to measure the flue gas as follows:

C2.1.2.1 For units with a maximum design heat input capacity greater than 8.79 MW (30 MBtu/hr): Opacity, except that CEMS is not required where gaseous or distillate fuels are the only fuels combusted

C2.1.2.2 For fossil-fuel fired units with a maximum design heat input capacity greater than 29.3 MW (100 MBtu/hr): nitrogen oxides (NO_X) and either oxygen (O_2) or carbon dioxide (CO_2)

C2.1.2.3 For facilities operational after 1 January 1976 with a maximum design heat input capacity greater than 293 MW (1,000 MBtu/hr): SO_2, NO_x, O_2, and particulate matter.

C2.2 INCINERATORS

Installations that operate an incinerator unit (for urban waste, sludge, or medical waste) will provide the Spanish Base Commander with sufficient information to seek an operating permit for their unit (see Chapter 1 for the process). A technical report (with the facility's design specifications) and an annex with the corresponding environmental information (including data on the projected air emissions) must be submitted with the permit request.

The following requirements do not apply to incinerators combusting hazardous waste or munitions. Refer to Chapter 6 for information regarding hazardous waste disposal, including hazardous waste incineration (C6.10.7).

C2.2.1 Incinerators (Non-medical). All incinerators issued an operating permit on or after 1 December 1992 must meet the standards specified in Table 2.4.

Monitoring Requirements. Temperature, particulate matter (expressed in opacity units), CO, oxygen, and HCl must be continuously measured and recorded for incinerators with a capacity > 1 ton/hr.

C2.2.2 Sewage Sludge Incinerators. All non-hazardous sewage sludge incinerators must be designed to meet the emissions limits in Table 2.4. Incinerators for hazardous sewage sludge (i.e., waste codes 19 08 03, 19 08 06, and 19 08 07) must be designed to meet the emissions limits established in Chapter 6.

C2.2.3 Medical Waste Incinerators (MWI). The following standards apply to new and existing units. These requirements do not apply to any portable units (field deployable). Existing sources must comply within 5 years of the publication date of this document. Refer to Chapter 8 for other requirements pertaining to medical waste management.

C2.2.3.1 All new and existing MWI must be designed and operated according to the following standards:

Flue gas temperature and internal combustion chamber (for waste containing > 1% of halogenated organic substances expressed as chlorine)	850 °C (1,100 °C)
O_2 content in wet flue gas	6% volume
Contact time	2 seconds

The incinerator must be equipped with auxiliary burners that are automatically activated when the flue gas temperature drops below the minimum flue gas temperature (850 °C or 1,100 °C depending on the waste stream).

C2.3 PERCHLOROETHYLENE (PCE) DRY CLEANING MACHINES

The following requirements apply to new and existing dry cleaning machines. These requirements do not apply to coin-operated machines. Existing sources must comply within 3 years of the publication date of this document.

C2.3.1 Emissions from existing PCE dry cleaning machines, at installations that use more than 2,000 gallons/year of PCE (installation wide) in their dry cleaning operations, must be controlled with a refrigerated condenser, or, if already installed, a carbon absorber. The temperature of the refrigerated condenser must be maintained at 45°F or less. Dry cleaning machines and control devices must be operated according to manufacturer recommendations.

C2.3.2 All new PCE dry cleaning systems must be of the dry-to-dry design with emissions controlled by a refrigerated condenser. The temperature of the refrigerated condenser must be maintained at 45°F or less. Dry cleaning machines and control devices must be operated according to manufacturer recommendations.

C2.4 CHROMIUM ELECTROPLATING AND CHROMIUM ANODIZING TANKS

The following standards apply to new and existing tanks. Existing sources must comply within 3 years of the publication date of this document.

C2.4.1 Ventilation exhaust from new and existing tanks must be controlled by a wet scrubber, composite mesh-pad eliminator, fiber bed filter, or equivalent control device capable of limiting emissions to 0.015 milligrams per dry standard cubic meter (mg/dscm). Control devices must be operated according to manufacturer recommendations.

C2.4.2 Alternatively, in lieu of control devices, decorative chromium and chromium anodize tanks may use chemical tank additives to prevent the surface tension from exceeding 45 dynes per centimeter provided that the surface tension is monitored prior to the first initiation of electric current on a given day and every 4 hours thereafter.

C2.5 HALOGENATED SOLVENT CLEANING MACHINES

These requirements apply to new and existing solvent cleaning machines that use solvent which contains more than 5 percent by weight: methylene chloride (CAS No. 75-09-2), perchloroethylene (CAS No. 127-18-4), trichloroethylene (CAS No. 79-01-6), 1,1,1-trichloroethane (CAS No. 71-55-6), carbon tetrachloride (CAS No. 56-23-5), chloroform (CAS No. 67-66-3), or any combination of these halogenated solvents. Existing sources must comply within 3 years of the publication date of this document. (Note: 1,1,1-trichloroethane is an ozone depleting substance that must be phased out of existence by 31 December 2008.)

C2.5.1 All cold cleaning machines (remote reservoir and immersion tanks) must be covered when not in use. Additionally, immersion type cold cleaning machines must have either a 1-inch water layer or a freeboard ratio of at least 0.75.

C2.5.2 All vapor cleaning machines (vapor degreasers) must incorporate design and work practices which minimize the direct release of halogenated solvent to the atmosphere.

C2.6 OZONE DEPLETING SUBSTANCES (ODS)

The following criteria apply to direct atmospheric emissions of ODS:

C2.6.1 Except as allowed in C2.6.2, use (i.e., utilization in maintenance or servicing of products and equipment) of the following ODSs is prohibited. Running an existing system without maintenance (e.g., using a refrigerator) would not be classified as use.

- Chlorofluorocarbons (CFCs)
- Other fully halogenated chlorofluorocarbons
- Halons
- Carbon tetrachloride
- 1,1,1-Trichloroethane
- Hydrobromofluorocarbons

C2.6.2 Halons may still be used under the following conditions:

- Halons that have been recovered, recycled, or reclaimed may be used in existing fire protection systems and fire extinguishers until 31 December 2002.
- Fire protection systems and fire extinguishers containing halons may be operated without maintenance or servicing of the halons, but must be decommissioned and the halons recovered before 31 December 2003.
- Halons for critical uses as specified in Table 2.6.

C2.6.3 Except as allowed in C2.6.4, use (i.e., utilization in maintenance or servicing of products and equipment) of hydrochlorofluorocarbons (HCFCs) is prohibited in the following applications. Running an existing system without maintenance (e.g., using a refrigerator) would not be classified as use.

C2.6.3.1 In aerosols

C2.6.3.2 As solvents:

- In non-contained solvent uses (including open-top cleaners and open-top dewatering systems without refrigerated areas, in adhesives and mould-release agents when not employed in closed equipment, and for drain cleaning where HCFCs are not recovered)
- From 1 January 2002, in all solvent uses except precision cleaning of electrical and other components in aerospace and aeronautics applications, where use is prohibited beginning on 31 December 2008

C2.6.3.3 As refrigerants:

C2.6.3.3.1 In equipment produced after 31 December 1995 for the following uses:

- In non-confined direct-evaporation systems
- In household refrigerators and freezers
- In motor vehicle, tractor, and off-road vehicle or trailer air-conditioning systems operating on any energy source. However, for military applications, the use is prohibited on 31 December 2008
- In road public-transport air-conditioning

C2.6.3.3.2 In equipment produced after 31 December 1997 for use in rail transport air-conditioning

C2.6.3.3.3 In equipment produced after 31 December 1999 for the following uses:

- In public and distribution cold stores and warehouses
- For equipment of 150 kW and over, shaft input

C2.6.3.3.4 In all other refrigeration and air-conditioning equipment produced after 31 December 2000 with two exceptions:

- HCFCs can be used in fixed air-conditioning equipment with a cooling capacity of less than 100 kW until 1 July 2002
- HCFCs can be used in reversible air-conditioning/heat pumps until 1 January 2004

C2.6.3.3.5 The use of virgin HCFCs in the maintenance and servicing of refrigeration and air-conditioning equipment shall be prohibited on 1 January 2010. The use of all HCFCs in the maintenance and servicing of refrigeration and air-conditioning equipment shall be prohibited on 1 January 2015.

C2.6.3.4 For the production of foams except integral skin foams for use in safety applications and rigid insulating foams

C2.6.3.5 As carrier gas for sterilization substances in closed systems, in equipment produced after 31 December 1997

C2.6.3.6 In all other applications

C2.6.4 The use of HCFCs shall be permitted:

C2.6.4.1 In laboratory uses, including research and development

C2.6.4.2 As feedstock (i.e., undergoes chemical transformation in a process in which it is entirely converted from its original composition and its emissions are insignificant)

C2.6.4.3 As halon substitutes in existing fire protection systems specified in Table 2.6 under the following conditions:

- Original halons contained in such fire protection systems shall be replaced completely
- Halons withdrawn shall be disposed in accordance with DoD 4160.21-M, Defense Materiel Disposition Manual, Chapter 10.

C2.6.5 ODS Refrigerant Venting Prohibition. Do not intentionally release any ODS refrigerant (identified in Table 2.5) in the course of maintaining, servicing, repairing, or disposing of appliances, industrial process refrigeration units, air conditioning units, or motor vehicle air conditioners. *De minimis* releases associated with good faith attempts to recycle or recover ODS refrigerants are not subject to this prohibition.

C2.6.6 ODS Fire Suppression Agent (Halon) Venting Prohibition. Do not intentionally release halons into the environment while testing, maintaining, servicing, repairing, or disposing of halon-containing equipment or using such equipment for technician training. Halon uses authorized in C2.6.2 are exempt from the venting prohibition in the following situations:

- *De minimis* releases associated with good faith attempts to recycle or recover halons (i.e., release of residual halon contained in fully discharged total flooding fire extinguishing systems)

- Emergency releases for the legitimate purpose of fire extinguishing, explosion inertion, or other emergency applications for which the equipment or systems were designed
- Releases during the testing of fire extinguishing systems if each of the following is true: systems or equipment employing suitable alternative fire extinguishing agents are not available; release of extinguishing agent is essential to demonstrate equipment functionality; failure of system or equipment would pose great risk to human safety or the environment; and, a simulant agent (i.e., substitute product that can perform the same function) cannot be used

C2.6.7 Recovery Requirements for ODSs. ODSs identified in Table 2.5 shall be recovered as follows using equipment operated by trained personnel:

- ODSs contained in commercial and industrial refrigeration/air-conditioning equipment, equipment containing solvents, fire protection systems, and fire extinguishers shall be recovered for disposition in accordance with DoD 4160.21-M, Defense Materiel Disposition Manual, Chapter 10
- After 31 December 2001, ODSs contained in domestic refrigerators and freezers shall be recovered per DoD 4160.21-M, Defense Materiel Disposition Manual, Chapter 10
- ODSs contained in products, installations, and equipment other than those mentioned above shall be recovered, if practicable, per DoD 4160.21-M, Defense Materiel Disposition Manual, Chapter 10

C2.6.8 Leakage of ODSs. The following precautionary measures must be taken to prevent leakage of ODSs in Table 2.5:

- All precautionary measures practicable shall be taken to prevent leakage of ODSs. In particular, fixed equipment with a refrigerating fluid charge of more than 3 kg shall be checked annually for leakages
- All precautionary measures practicable shall be taken to prevent and minimize leakage of methyl bromide from fumigation installations and operations in which methyl bromide are used
- All precautionary measures practicable shall be taken to prevent and minimize any leakage of ODSs inadvertently produced in the course of the manufacture of other chemicals

C2.7 MOTOR VEHICLES

This criterion applies to DoD-owned motor vehicles (as defined in the definitions section).

C2.7.1 Inspect all vehicles as follows to ensure that no one has tampered with the factory-installed emission control equipment:

Vehicle Age	Inspection Frequency
0-4 years	every 2 years
after 4 years	annually

CO emission limits for gasoline vehicles manufactured in Europe when at idle will not exceed 5% by volume (at 15-20º C and 750-760 mm Hg). Motor vehicles manufactured in Europe and equipped with diesel engines will not exceed the following opacity limits:

Engine Power (Horsepower)	Absolute Units
> 200	2.1
>100 and <200	2.4
< 100	2.8

Notes:
1. The opacity limits are based on measures made at a minimum motor temperature of 60°C.

C2.7.2 Use only unleaded gasoline in vehicles that are designed for this fuel.

C2.8 FUEL COMPOSITION

The composition of fuels permitted for use in Spain is specified in the following table.

Parameter	Units	Diesel Fuel	#1 Fuel Oil	#2 Fuel Oil
Density at 15°C	kg/L	0.9	- - -	- - -
Viscosity at 100°C	mm^2/S	- - -	27	37
Total sulfur content	% by weight	0.2 [1, 2]	2.5	3.5
Water and sediments	% by volume	0.1	1	1
Water	% by volume	- - -	0.5	0.5

Notes:
1. 0.05% effective 1 Oct 1996 for Class A automotive diesel.
2. 350 mg/kg (0.035%) effective 1 Jan 2000 for Class A automotive diesel.

ADMINISTRATIVE ITEMS

The following items shall be provided to the Spanish Base Commander for further transmittal as appropriate:

1. Installations that operate thermal units (steam generating unit, or thermal heating units) will provide the Spanish Base Commander with sufficient information to seek an operating permit for their units (see Chapter 1 for the process). A technical report (with the facility's design specifications) and an annex with the corresponding environmental information (including data on the projected air emissions) must be submitted with the permit request. The Spanish Base Commander may submit the permit request and technical report to the Technological

Development and Employment Department of Andalusia (Consejería de Empleo y Desarrollo Tecnológico).

2. Installations that operate an incinerator unit (for urban waste, sludge, or medical waste) will provide the Spanish Base Commander with sufficient information to seek an operating permit for their unit (see Chapter 1 for the process). A technical report (with the facility's design specifications) and an annex with the corresponding environmental information (including data on the projected air emissions) must be submitted with the permit request.

Table 2.1 – Maximum Emission Limits for Combustion Units for Energy Production [3] 50 MW (170.6 MBtu/Hr)

Fuel	Thermal Capacity of Facility [1]		Emission Limit [2]			
	(MW)	(MBTU/hr)	SO_2 (mg/Nm^3)	Particulate Matter (mg/Nm^3)	NO_x [4] (mg/Nm^3)	Opacity [3] (%)
Solid fuel	50 - 100	170.6 – 341.3	2,000	100	650[5]	20%
	100 - 500	341.3 – 1,706.5	400 – 2,000	100	650[5]	20%
	> 500	> 1,706.5	400	50	650[5]	20%
Liquid fuel	50 - 300	170.6 - 1,023.9	1,700	50[6]	450	20%
	300 - 500	1,023.9 - 1,706.5	400 - 1,700	50[6]	450	20%
	> 500	> 1,706.5	400	50[6]	450	20%
Gas fuel Combustible gaseous materials in general	NA	NA	35	5 10[7] 50[8]	350	20%
Liquified gas	NA	NA	5		350	20%

Notes:

1. Maximum design heat input capacity
2. Standards do not apply during periods of start up, shut down, or when emergency conditions exist.
3. The 20% opacity standard applies to the average opacity over a 6-minute period per hour.
4. The emission limit for NO_X is based on a 30-day rolling average.
5. The limit is 650 mg/Nm^3 for solid fuel in general, and 1,300 mg/Nm^3 for solid fuel with <10% volatile materials.
6. For units with <100 MW thermal capacity that use combustibles with an ash content >0.06%, the particulate matter emission limit is 100 mg/Nm^3.
7. For blast-furnace gas.
8. For gas produced by the iron and steel industry to be used in other types of plants.

Table 2.2 – Emission Limits for Combustion Units for Energy Production < 50 MW (170.6 MBtu/hr)

Fuel Source	Emission Limits		
	Opacity [(1)] (%)	SO_2 (mg/Nm^3)	Particulate Matter (mg/Nm^3)
Liquid fuels	20	5,500	200
Solid fuel (anthracite coal)	20	2,400	400
Solid fuel (lignite coal)	20	9,000	400

Notes:

1. The limits should not exceed 40% opacity or more than one 2-minute period per hour.
2. The units of mg/Nm^3 are at normal physical conditions of 0ºC and 0.1013 Mpa.

Table 2.3 – Emission Limits for Industrial Combustion Facilities (Steam/Heat Generating Units, Excluding Thermal Plants)

Fuel Source	Emission Limits		
	Opacity [1] (%)	SO_2 (mg/Nm^3)	CO (ppm)
Gas oil or domestic fuel oil	20	1,700	1.445
Heavy #1 fuel oil	40	4,200	1.445
Heavy #2 fuel oil	50	6,800	1.445

Notes:

1. The limits should not be exceeded more than three times per day, with each period lasting < 10 minutes.
2. The units of mg/Nm^3 are at normal physical conditions of 0ºC and 0.1013 Mpa.

Table 2.4 – Emission Limits for Municipal Solid Waste Incinerators

Pollutant	< 1 ton/hr	³ 1 ton/hr but £ 3 tons/hr	³ 3 tons/hr
	(mg/Nm^3)	(mg/Nm^3)	(mg/Nm^3)
Total dust (PM)	200	100	30
Heavy metals:			
Pb + Cr + Cu + Mn	-	5	5
Ni + As	-	1	1
Cd + Hg	-	0.2	0.2
Hydrochloric acid (HCl)	250	100	50
Hydrofluoric acid (HF)	-	4	2
Organic Substances (TOC)	-	20	20
CO	-	100	100
Sulfur dioxide (SO_x)	-	300	300

Notes:

1. The emissions are considered in compliance with the limits if the 7-day average does not exceed the corresponding emission limit and the 1-day average does not exceed 30% of the corresponding emission limit. The average values are calculated including measurements collected during start-up and shut-down operations.
2. For plants with a capacity < 1 ton/hr, the emission limits may refer to an oxygen level of 17%. In this case, the emissions should not exceed the above limits divided by 2.5.

Table 2.5 – Ozone Depleting Substances

Molecular Formula	Common Name	CAS Number[1]	Chemical Name
Chlorofluorocarbons (CFCs)			
$CFCl_3$	CFC – 11	75-69-4	Trichlorofluoromethane
CF_2Cl_2	CFC – 12	75-71-8	Dichlorodifluoromethane
$C_2F_3Cl_3$	CFC – 113	76-13-1	Trichlorotrifluoroethane
$C_2F_4Cl_2$	CFC – 114	76-14-2	Dichlorotetrafluoroethane
C_2F_5Cl	CFC – 115	76-15-3	Chloropentafluoroethane
Other Fully Halogenated Chlorofluorocarbons			
CF_3Cl	CFC – 13	75-72-9	Chlorotrifluoromethane
C_2FCl_5	CFC – 111	354-56-3	Pentachlorofluoroethane
$C_2F_2Cl_4$	CFC – 112	76-12-0	Tetrachlorodifluoroethane
C_3FCl_7	CFC – 211	422-78-6	Heptachlorofluoropropane
$C_3F_2Cl_6$	CFC – 212	3182-26-1	Hexachlorodifluoropropane
$C_3F_3Cl_5$	CFC – 213	2354-06-5	Pentachlorotrifluoropropane
$C_3F_4Cl_4$	CFC – 214	29255-31-0	Tetrachlorotetrafluoropropane
$C_3F_5Cl_3$	CFC – 215	4259-43-2	Trichloropentafluoropropane
$C_3F_6Cl_2$	CFC – 216	661-97-2	Dichlorohexafluoropropane
C_3F_7Cl	CFC – 217	422-86-6	Chloroheptafluoropropane
$CF_2Cl_2 \bullet C_2F_2H_4$	CFC – 500	56275-41-3	Dichlorodifluoromethane • Difluoroethane
$CHF_2Cl \bullet C_2F_5Cl$	CFC – 502	74-45-6 and 76-15-3	Chlorodifluoromethane • Chloropentafluoroethane
$CF_3Cl \bullet CHF_3$	CFC – 503	75-72-9 and 75-46-7	Chlorotrifluoromethane • Trifluoromethane
Halons			
CF_2BrCl	Halon – 1211	353-59-3	Bromochlorodifluoromethane
CF_3Br	Halon – 1301	75-63-8	Bromotrifluoromethane
$C_2F_4Br_2$	Halon – 2402	124-73-2	Dibromotetrafluoroethane
Carbon Tetrachloride			
CCl_4	Carbon Tetrachloride	56-23-5	Carbon Tetrachloride
1,1,1-trichloroethane			
$C_2H_3Cl_3$	Methyl Chloroform	71-55-6	1,1,1-trichloroethane
Methyl Bromide			
CH_3Br	Methyl Bromide	74-83-9	Methyl Bromide
Hydrobromofluorocarbons			
$CHFBr_2$	N/A		Dibromofluoromethane
CHF_2Br	HBFC-22B1		Bromodifluoromethane
CH_2FBr	N/A		Bromofluoromethane
C_2HFBr_4	N/A		Tetrabromofluoroethane
$C_2HF_2Br_3$	N/A		Tribromodifluoroethane
$C_2HF_3Br_2$	N/A		Dibromotrifluoroethane

Molecular Formula	Common Name	CAS Number[1]	Chemical Name
C_2HF_4Br	N/A		Bromotetrafluoroethane
$C_2H_2FBr_3$	N/A		Tribromofluoroethane
$C_2H_2F_2Br_2$	N/A		Dibromodifluoroethane
$C_2H_2F_3Br$	N/A		Bromotrifluoroethane
$C_2H_3FBr_2$	N/A		Dibromofluoroethane
$C_2H_3F_2Br$	N/A		Bromodifluoroethane
C_2H_4FBr	N/A		Bromofluoroethane
C_3HFBr_6	N/A		Hexabromofluoropropane
$C_3HF_2Br_5$	N/A		Pentabromodifluoropropane
$C_3HF_3Br_4$	N/A		Tetrabromotrifluoropropane
$C_3HF_4Br_3$	N/A		Tribromotetrafluoropropane
$C_3HF_5Br_2$	N/A		Dibromopentafluoropropane
C_3HF_6Br	N/A		Bromohexafluoropropane
$C_3H_2FBr_5$	N/A		Pentabromofluoropropane
$C_3H_2F_2Br_4$	N/A		Tetrabromodifluoropropane
$C_3H_2F_3Br_3$	N/A		Tribromotrifluoropropane
$C_3H_2F_4Br_2$	N/A		Dibromotetrafluoropropane
$C_3H_2F_5Br$	N/A		Bromopentafluoropropane
$C_3H_3FBr_4$	N/A		Tetrabromofluoropropane
$C_3H_3F_2Br_3$	N/A		Tribromodifluoropropane
$C_3H_3F_3Br_2$	N/A		Dibromotrifluoropropane
$C_3H_3F_4Br$	N/A		Bromotetrafluoropropane
$C_3H_4FBr_3$	N/A		Tribromofluoropropane
$C_3H_4F_2Br_2$	N/A		Dibromodifluoropropane
$C_3H_4F_3Br$	N/A		Bromotrifluoropropane
$C_3H_5FBr_2$	N/A		Dibromofluoropropane
$C_3H_5F_2Br$	N/A		Bromodifluoropropane
C_3H_6FBr	N/A		Bromofluoropropane
Hydrochlorofluorocarbons (HCFCs)			
$CHFCl_2$	HCFC – 21		Dichlorofluoromethane
CHF_2Cl	HCFC – 22		Chlorodifluoromethane
CH_2FCl	HCFC – 31		Chlorofluoromethane
C_2HFCl_4	HCFC – 121		Tetrachlorofluoroethane
$C_2HF_2Cl_3$	HCFC – 122		Trichlorodifluoroethane
$C_2HF_3Cl_2$	HCFC – 123		Dichlorotrifluoroethane
C_2HF_4Cl	HCFC – 124		Chlorotetrafluoroethane
$C_2H_2FCl_3$	HCFC – 131		Trichlorofluoroethane
$C_2H_2F_2Cl_2$	HCFC – 132		Dichlorodifluoroethane
$C_2H_2F_3Cl$	HCFC – 133		Chlorotrifluoroethane
$C_2H_3FCl_2$	HCFC – 141		Dichlorofluoroethane
CH_3CFCl_2	HCFC – 141b		1,1-dichloro-1-fluoroethane
$C_2H_3F_2Cl$	HCFC – 142		Chlorodifluoroethane
CH_3CF_2Cl	HCFC – 142b		1-chloro-1,1-difluoroethane
C_2H_4FCl	HCFC – 151		Chlorofluoroethane
C_3HFCl_6	HCFC – 221		Hexachlorofluoropropane
$C_3HF_2Cl_5$	HCFC – 222		Pentachlorodifluoropropane
$C_3HF_3Cl_4$	HCFC – 223		Tetrachlorotrifluoropropane
$C_3HF_4Cl_3$	HCFC – 224		Trichlorotetrafluoropropane
$C_3HF_5Cl_2$	HCFC – 225		Dichloropentafluoropropane

Molecular Formula	Common Name	CAS Number[1]	Chemical Name
$CF_3CF_2CHCl_2$	HCFC – 225ca		1,1-dichloro-2,2,3,3,3-pentafluoropropane
CF_2ClCF_2CHClF	HCFC – 225cb		1,3-dichloro-1,2,2,3,3-pentafluoropropane
C_3HF_6Cl	HCFC – 226		Chlorohexafluoropropane
$C_3H_2FCl_5$	HCFC – 231		Pentachlorofluoropropane
$C_3H_2F_2Cl_4$	HCFC – 232		Tetrachlorodifluoropropane
$C_3H_2F_3Cl_3$	HCFC – 233		Trichlorotrifluoropropane
$C_3H_2F_4Cl_2$	HCFC – 234		Dichlorotetrafluoropropane
$C_3H_2F_5Cl$	HCFC – 235		Chloropentafluoropropane
$C_3H_3FCl_4$	HCFC – 241		Tetrachlorofluoropropane
$C_3H_3F_2Cl_3$	HCFC – 242		Trichlorodifluoropropane
$C_3H_3F_3Cl_2$	HCFC – 243		Dichlorotrifluoropropane
$C_3H_3F_4Cl$	HCFC – 244		Chlorotetrafluoropropane
$C_3H_4FCl_3$	HCFC – 251		Trichlorofluoropropane
$C_3H_4F_2Cl_2$	HCFC – 252		Dichlorodifluoropropane
$C_3H_4F_3Cl$	HCFC – 253		Chlorotrifluoropropane
$C_3H_5FCl_2$	HCFC – 261		Dichlorofluoropropane
$C_3H_5F_2Cl$	HCFC – 262		Chlorodifluoropropane
C_3H_6FCl	HCFC – 271		Chlorofluoropropane

Note:

1. The American Chemical Society's Chemical Abstracts Service number.

Table 2.6 – Critical Uses of Halon

Use of Halon 1301: 1. In aircraft for the protection of crew compartments, engine nacelles, cargo bays, and dry bays 2. In military land vehicles and naval vessels for the protection of spaces occupied by personnel and engine compartments 3. For the making inert of occupied spaces where flammable liquid and/or gas release could occur in the military and oil, gas and petrochemical sector, and in existing cargo ships 4. For the making inert of existing manned communication and command centers of the armed forces or others, essential for national security 5. For the making inert of spaces where there may be a risk of dispersion of radioactive matter 6. In the Channel Tunnel and associated installations and rolling stock
Use of Halon 1211: 1. In hand-held fire extinguishers and fixed extinguisher equipment for engines for use on board aircraft 2. In aircraft for the protection of crew compartments, engine nacelles, cargo bays and dry bays 3. In fire extinguishers essential to personal safety used for initial extinguishing by fire brigades 4. In military and police fire extinguishers for use on persons